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THE LIFE-HISTORIES OF THE NEW YORK SLUG CATERpillars.—XV.

PLATE VI, FIGS. I—II.

BY HARRISON G. DYAR, A.M., PH.D.

Heterogenea flexuosa Grote.*

1880—*Limacodes flexuosa* GROTE, North Am. Ent. I, 60.

1880—*Limacodes cæsonia* GROTE, North Am. Ent. I, 60.

1894—*Heterogenea cæsonia* and *flexuosa* NEUMÖGEN & DYAR, Journ. N. Y. Ent. Soc. III, 74.

LARVA.

1878—GLOVER, Ill. North Am. Ent. pl. 95, fig. 19.

1893—PACKARD, Proc. Am. Phil. Soc. XXXI, 105 (as "full grown larva of *Heterogenea* sp.").

1895—DYAR & MORTON, Journ. N. Y. Ent. Soc. III, 146 (in synopsis).

1896—DYAR, Journ. N. Y. Ent. Soc. IV, pl. VI, figs. 3 and 4 (as *Tortricidia pallida*).

SPECIAL STRUCTURAL CHARACTERS.

Dorsal space narrow, of even width, scarcely narrowing at the ends, gently arched; joint 13 rounded prominent. Lateral space broad, oblique, narrowing to the extremities; subventral space small, retracted. Subdorsal ridge slight; indicating the change in direction between back and sides; lateral ridge rather prominent, overhanging the subventral space. Outline elliptical, joint 13 only slightly notched on the sides, not forming a quadrate tail. Depressed spaces (1)–(8) present, the subventral ones (7) and (8) only indicated, the others sharp edged and deep, large, dividing the surface into latticed ridges as in *Tortricidia pallida*, (4) the largest, transversely elongated, the lower segmental (5) moderate, the intersegmental (6) very small, alternating exactly in line with the lower edge of (5). Skin surface covered with coarse clear granules, the depressed spaces finely granular in the base. In the first stage the setæ are arranged as in *T. pallida*, but disappear at the first molt when all the structural characters are assumed nearly in their mature form. Coloration of the pattern and colors of *T. pallida*, modified in detail.

* This is not a *Heterogenea*; but I reserve generic corrections till the end of these articles.

AFFINITIES, HABITS, ETC.

This larva is very closely allied to *T. pallida*, but differs in several characters, nearly all of which are a higher specialization. In stage I the setæ are smaller, not so distinctly alternating and the anterior limb of the Y-shaped spines is slightly shortened. After the first molt the setæ are nearly obliterated, being much more reduced than in *T. pallida*. The granules are smoother, more appressed, not subpapillose on the lateral ridge as in the younger stages of *T. pallida* and the depressed spaces are, if anything, larger. The red mark appears at the same time or sooner than in its ally, but is never so large. It does not exceed the lateral extension of *T. pallida* of stage V even in the last stage, VII, though the longitudinal extension is the same in both in the case of the most heavily marked *H. flexuosa*. The amount of variation is perhaps not greater in *flexuosa* than in its ally, though the breaking up of the red band gives the appearance of greater diversity.

The moths emerge during the last week in June and lay the eggs singly on the backs of the leaves. The favorite food plant is the chestnut and the larvæ occur on the lower of the main branches of this tree, not on the low shoots nor on any but the old matured leaves. The oak is also a food plant; I have found the larvæ abundantly on *Q. coccinea*, very rarely on *Q. alba*. The larvæ mature early in September. This species occurs scattered all over New York State, usually rare, but occasionally locally common. I have taken it in most of the wooded parks around New York City and at various places in Long Island. The present life-history was completed from a newly hatched larva which I found in Bronx Park after a two days' search, in which I was kindly assisted by Mrs. P. N. Knopf and Miss L. I. Hoff.

CRITICISM OF PREVIOUS DESCRIPTIONS.

Dr. Packard has described this larva without knowing what it was. I have made an unfortunate error in the description of *Tortricidia pallida* (Journ. N. Y. Ent. Soc., IV, 170-1), and included characters of *H. flexuosa* in stages II, III and VI. The figures on the plate of the young larva (figs. 3 and 4) represent stages IV and VI of *H. flexuosa*. The text of *T. pallida* will be specifically corrected in the "additions and corrections" to follow at the end of these articles.

DESCRIPTION OF THE SEVERAL STAGES IN DETAIL.

Egg.—Elliptical, flat as usual; 1.1×.7 mm., the shell colorless, white.

Stage I.—Rounded elliptical, tail round; skin smooth, depressed a

little dorsally above the bases of the tubercles in paired hollows. All colorless. Setæ Y-shaped in the subdorsal row on joints 4-11, the front limb a little shorter than the back one (Plate VI, fig. 1); two setæ on joints 3 and 13; a middle row of two on each of joints 3 and 4; a single lateral row on joints 3-12. Tips of setæ a little enlarged, not distinctly swollen. Subventral setæ very fine, obscure, all pale. Head colorless, eye black; body whitish, food greenish. Length, .9-1.4 mm.

Stage II.—Narrowly elliptical, tail rounded quadrate; dorsum broad and flat, the subdorsal ridge forming its sharply angled edge. Smooth, regular, all the depressed spaces (1) to (6) large and very distinct. Sides concave, lateral ridge smooth; subventral area retracted. Latticed ridges covered with smooth, dense, frosted, appressed granules, one row wide, uniform, not papillose anywhere. Setæ absent. Color opaque whitish; later distinctly pale green. Length, 1.3-1.8 mm.

Stage III.—Rounded, rather broadly elliptical, sides concave at first so that the dorsum stands up as a broad ridge gently arching from head to tail. Tail slightly notched at the sides, rounded. Depressed spaces very distinct, (4) narrowly elongate. Latticed ridges beaded with clear appressed granules, not generally over one granule wide in the narrower parts. Bottoms of the spaces finely granular, dotted, the larger ones with shallow, saucer-like centers. Color green; a yellow line appears along the subdorsal ridge on joints 5-9, widened a little on each segment. Usually no other marking, but there may be a small, faint, or even distinct dark red dot between the lines on joint 8, or surrounding the depressed space (1) of joints 7-8. Length, 1.8-2.4 mm.

Stage IV.—Rather narrowly elliptical; tail rounded quadrate. Dorsum rather narrow, a little grooved at first. Lateral ridge extending beyond the subventral one. Depressed spaces large and sharp, the latticed ridges scarcely more than one granule wide, but the granules becoming wedge-shaped. All smooth, no setæ. Color light green, the yellow subdorsal lines reaching joints 5-10. The dorsal yellow mark varies from a narrow yellow bridge on joint 8 to a red bar on joints 7-8 (see the plate of *T. pallida*, pl. IV, fig. 3) or even a rather large round red patch, which does not encroach on the subdorsal lines. Length, 2.4-3.2 mm.

Stage V.—Shape as in the mature larva; tail rounded, scarcely notched at the sides. Dorsum not broad, sides oblique, concave. Latticed ridges several granules wide, smoothly evenly granular, a little frosted. Spaces finely shagreened with a circular shallow saucer-like centre. Color green, spaces not discolourous except a little yellow in

(4); a yellow subdorsal line on joints 3-12, not quite reaching either extremity, the pair unconnected at the ends, but centrally on joints 6-9, broadened to the top of the depressed spaces (4) and enclosing in the dorsal space a reddish patch on joints 7-8 with salmon-colored margin and dark brown latticed ridges. In some examples a reddish mark appears on joint 3 between the subdorsal lines. Length, 3.2-4.3 mm.

Stage VI.—Structures as before, tail rounded quadrate. Depressed spaces large, the latticed ridges closely clear granular. Green, the large lateral depressed spaces (4) shaded with yellow. The yellow subdorsal lines reach joints 3 and 13, entirely free * or joined by a yellow bridge on joints 7 to 9 containing a red spot of varying form, corresponding to the variety of the larva. In an example from Bellport, Long Island, the spot was cordate, the depression in front, pink and edged with a crimson line. In another it was in the form of a cross, darker, shaded with brown on the latticed ridges and encroaching on the subdorsal line. (See *T. pallida*, pl. VI, fig. 4.) In others the shape was circular, or of the form of the "club" or "spade" as usually depicted on playing cards. There is also another spot at the anterior end. In the Bellport larva it was elliptical, covering joint 3 dorsally, bright red and edged with yellow. In another from Fort Lee, N. J., it was shaded with dark brown like the central spot. It was present in a larva which lacked the central spot entirely. Length, 4.2-6.3 mm.

Stage VII.—(Plate VI, figs. 5 to 9.) Shape as described. Dorsal space of uniform width, scarcely narrowing anteriorly. Skin rather regularly coarsely watery granular on the latticed ridges, the depressed spaces narrow, finely granular. Color pale yellowish green, pigmented in the dorsal and upper half of lateral space, clearer green below. All the depressed spaces yellow in the bottom, the largest with glandular green centers. Subdorsal line yellow, straight from joint 3 to the tail, rather broad. On the anterior edge of joint 3 a red mark, widened along the edge, produced backward in the dorsal space more or less. The central dorsal red mark is very variable. It may be absent (Plate VI, fig. 8) or represented only by a narrow yellow bridge on joint 8 slightly red tinted (Plate VI, fig. 9). The usual form is a rounded cross, reaching on the sides nearly or quite to the lateral depressed spaces (4) and in the dorsal space on joints 7 to 9; it may be enlarged to a hexagon (Plate VI, fig. 6) or extend in a dorsal band the whole

* Out of 263 larvæ which were found in an oak woods at Yaphank, L. I., only three were entirely without the yellow bridge (Plate VI, fig. 8).

length (Plate VI, fig. 5). The color is crimson, marked with purplish brown or blackish on the latticed ridges in the place of the usual spots, a more or less distinct square pale spot covering the depressed space (1) of joints 7-8. Length, 6.3-10 mm.

Cocoon as usual.

Food-plants.—Chestnut, oak, hickory, wild cherry.

EXPLANATION OF PLATE VI.

- Fig. 1. Stage I, side view enlarged, diagrammatic.
" 2. One of the single setæ more enlarged.
" 3. Larva in stage III enlarged.
" 4. Granules from young larva.
" 5. Mature larva, enlarged, full pattern.
" 6. The same, widest spot.
" 7. Front and side views.
" 8. Mature larva, most reduced pattern.
" 9. The same, a small red spot.
" 10. Moth of *Heterogenea flexuosa*.
" 11. The same, variety *casonia*.
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NOTES ON SPECIES OF NOCTUA WITH DESCRIPTIONS OF NEW FORMS.

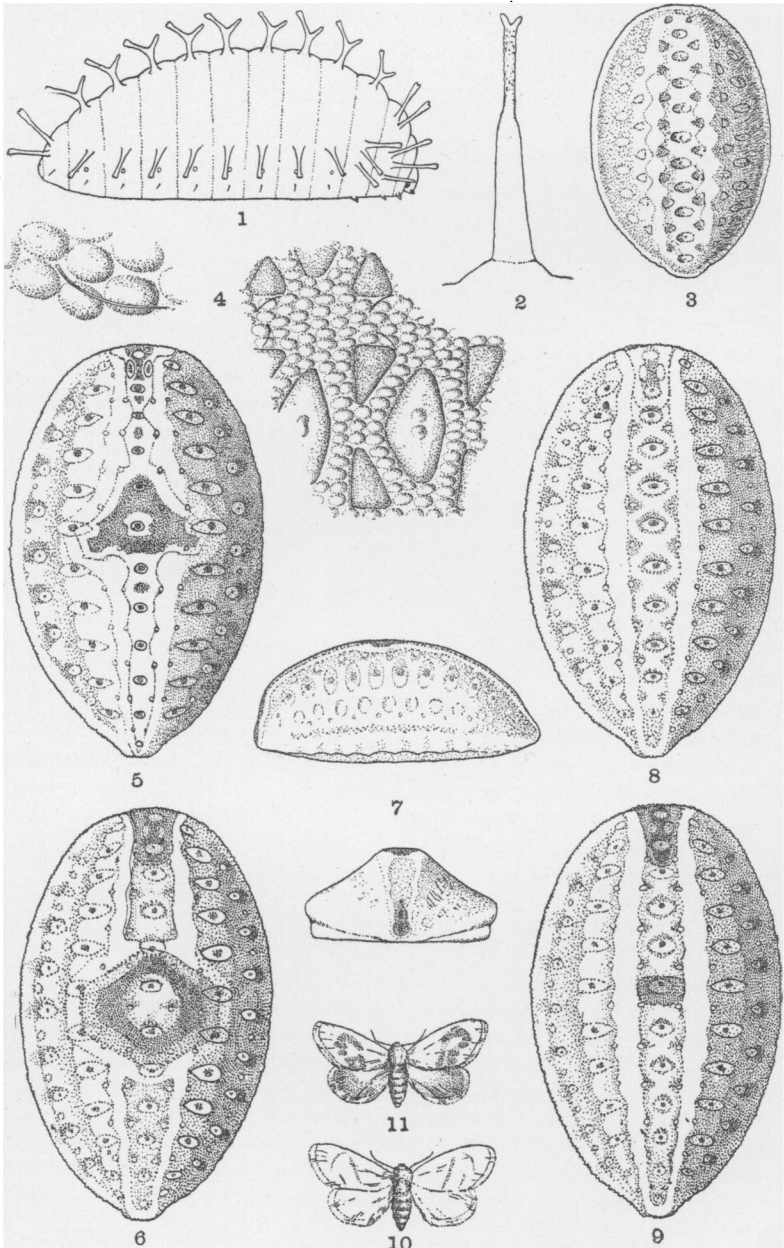
PLATE VII.

BY JOHN. B. SMITH, SC.D.

In 1890 I published a revision of the species theretofore lumped under the generic term *Agrotis*, as Bulletin No. 44 of the U. S. National Museum, and divided up the species among fifteen genera, new and old. The general conclusions reached in that paper have approved themselves to me since that period; but the increased material has necessitated some changes in the standing of certain species.

The genus *Noctua* as restricted by me contained species with all the tibiæ spinose, the anterior not heavily armed; front smooth and feebly convex; antennæ in the male ciliate only; vestiture hairy, scaly or mixed; primaries with apices rectangular or rounded, and as a whole rather subparallel, if varying in width.

Nothing essential need be added to this description, and all the new forms since seen fit very nicely into the definition. Most of the addi-



Life-History of *Heterogenea flexuosa*.